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## Space Weather Forecast

Issued on Wednesday, 15 May 2024 at 01:30 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

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**Space Weather Forecast Headline: Chance of Strong flares day 1 (15 May), but soon declining. Ongoing S1 Minor Solar Radiation Storm. Slight chance G1 Minor Storm day 1-2 (15-16 May).**

### Analysis of Space Weather Activity over past 24 hours

**Solar Activity:** High with three Strong flares observed from the large and complex sunspot now over the southwest limb. This included the largest flare (X8.7) of the solar cycle so far. There remains the potential for further strong flares to be visible despite its far-side location. There are twelve sunspot regions on the visible disc, however they are all small and simple, with the only notable growth observed in a small bipolar region in the northwest and a new emergent spot near the south-centre disc. Of the visible regions a small region in the northeast was the most active with a long duration Moderate flares.

Coronal mass ejections (CME) were observed from the flares mentioned, however these were not Earth-directed. A filament (line of material held together by the Sun's magnetic field) was also observed erupting off the northeast disc at 14/1000 UTC, with a complex CME observed. This has been assessed as likely missing, north and behind Earth, but a glancing interaction late day 3 or early day 4 (17-18 May) cannot be ruled out.

**Solar Wind / Geomagnetic Activity:** The tail-end of the recent CME enhanced solar wind continued, with elevated speeds of around 550 km/s observed. Total Interplanetary Magnetic Field (IMF), was initially Moderate but became Weak from 14/0600 UTC. The north-south component was generally weak and positive (northward), with only brief negative (southward) spells. Geomagnetic activity was Quiet to Unsettled (Kp1-3).

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy protons) is currently at S1/Minor Radiation storm, and briefly reached S2 Moderate Storm (14/0340-0650 UTC) due to the flare activity from the large complex sunspot (now over the southwest limb) during the last couple of days.

### Four-Day Space Weather Forecast Summary

**Solar Activity:** Moderate to High activity is likely to continue day 1 (15 May) with the potential for further flaring to be visible from the sunspot just over the southwest limb, before it moves further away onto the far-side. Activity then declining to Low with a chance of increasing to Moderate with isolated M-flares from the smaller and simple regions on the visible disc.

**Solar Wind / Geomagnetic Activity:** There are two CMEs that are currently expected to largely miss Earth, but have some potential for glancing interactions. The first is from the long duration M6.6 flare of AR3664 on 13 May, perhaps glancing later day 1 or early day 2 (15-16 May). The second from the filament eruption on the north-east disc on 14 May, perhaps arriving late day 3 or early day 4 (17-18 May). Both of these are low confidence. Otherwise, no other sources of enhancement are expected with current elevated solar winds expected to gradually ease. Mainly Quiet activity is expected with Unsettled intervals, but with the potential for Unsettled to Active spells with a chance of G1 Minor Storm intervals from any CME glances.

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**Energetic Particles / Solar Radiation:** The count rate of energetic particles is likely to continue above the S1 Minor Radiation storm threshold, but with a declining trend and falling below this level day 2 (16 May). However further increases are also possible given the occurrence of any significant flares from the large and complex sunspot region as it continues to rotate beyond the west limb.

**Geomagnetic Storms:**

| Geo-Magnetic Storm       | Level    | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------------------|----------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability (Exceedance) |          |                        | (%)               | (%)               | (%)               | (%)               |
| Minor or Moderate        | G1 to G2 | No                     | 20                | 20                | 5                 | 5                 |
| Strong                   | G3       | No                     | 1                 | 1                 | 1                 | 1                 |
| Severe                   | G4       | No                     | 1                 | 1                 | 1                 | 1                 |
| Extreme                  | G5       | No                     | 1                 | 1                 | 1                 | 1                 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares | Level         | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------|---------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability  |               |                        | (%)               | (%)               | (%)               | (%)               |
| Active       | R1-R2 M Class | Yes                    | 80                | 50                | 40                | 40                |
| Very Active  | R3 to R5 X    | Yes                    | 50                | 10                | 1                 | 1                 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms         | Level (cm <sup>-2</sup> sr <sup>-1</sup> s <sup>-1</sup> ) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------------------|------------------------------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability (Exceedance) |                                                            |                        | (%)               | (%)               | (%)               | (%)               |
| Active                   | ≥ S1                                                       | Yes                    | 100               | 60                | 30                | 10                |
| Very Active              | ≥ S3 *                                                     | No                     | 5                 | 5                 | 5                 | 1                 |

\* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm<sup>-2</sup>sr<sup>-1</sup>s<sup>-1</sup>)